CORRECTION FOR MAY, 1911, REVIEW.

On page 793, the formula in the middle of the first column should read: $0.674 \frac{1-r^2}{\sqrt{n}}$

The chart on page 794 should appear as Fig. 2 on page 795.

The chart on page 795 should appear as Fig. 1 on page 794.

On page 794, second column, sixth line, there should be a period after the first 729.22. -502.5, etc., begins a new sentence.

WEATHER, FORECASTS, AND WARNINGS JULY, 1911.

By EDWARD H. BOWIE, District Forecaster.

During the first half of the month the barometric pressure was above the normal over middle latitudes of the North Atlantic Ocean, and markedly so over the British Isles and Iceland; during the latter half the pressure was generally below normal over these regions, with well-defined depressions over the Azores on the 17th and 20th and again after the 25th, while sharp falls to low pressure were reported from the British Isles on the 16th and during the last five days of the month. Over continental Europe and Siberia the pressure was continually above the normal, except from the 9th to 18th over Russia, and on the 1st and 2d and again on the 17th to 19th over southwestern Europe. The region of the Philippines and the China seas appears to have been the locus of marked storm activity during the month, typhoons passing over the Philippines at the beginning of the month, on the 14th and 15th, and again during the last decade of the month. The last-named disturbance recurved and passed over Japan, causing disastrous floods and the loss of 100 or more lives. Over Alaska and the North Pacific Ocean pressure was near or below normal from the 1st to 10th, abnormally high from the 11th to 19th, and fluctuating near the normal after that date, although a sharp fall to 29.30 inches was recorded at Nome on the 29th.

Unusual heat prevailed over the eastern portions of the United States during the first 11 days of the month and during the latter half on the Pacific coast. It is reported that the month was one of extreme heat over the British Isles and continental Europe. Drought was severe in India, unquestionably due to the prevalence of abnormally high pressure over the interior of Asia during June and the greater part of July, which prevented the development of monsoons of normal force. Widespread rains during the second decade of July afforded much relief from the preceding drought in the middle-western and southwestern parts of the United States.

The first week in July was marked by phenomenally warm weather over the Northern and Middle States, from the Atlantic coast to the Missouri Valley and the Middle Plains States. Temperatures on several days exceeded 100° in the central valleys, eastern Nebraska, Kansas, and Oklahoma, and also at more northern stations in upper Michigan, New England, and the interior of New York and Pennsylvania. For intensity, this warm wave was the severest and most widespread since the summer of 1901. At a number of points in New England, the temperatures recorded exceeded all previous high temperature records, while at a number of points in the Ohio Valley and the Middle West previous high records were equaled and in some instances exceeded. This warm wave was the culmination of a prolonged period of high temperatures in the Middle West. On the 5th a depression passed over the Middle West and reached the Atlantic coast on the 7th. It was attended by local showers and thunderstorms and was followed by an area of high barometric pressure that dispersed the warm wave previously referred to. On the 5th a marked fall in pressure set in at Sitka, Alaska, and on Friday, the 7th, a well-defined disturbance appeared in the Northwest. It moved slowly southeastward to the northern plains States and thence northward, remaining stationary until the 10th in Alberta. This depression caused general showers in the plains States, the Mississippi Valley, and the lake region. It was preceded by a change to considerably warmer weather on the 9th and 10th in northeastern districts, and was followed by abnormally cool weather for the season on these dates in the Rocky Mountain region. Frost occurred in Wyoming, and during the night of the 8th there was light snow at the Yellowstone Park station. The weekly forecast of the 2d, which referred to the warm wave and announced its termination several days in advance, follows:

> The coming week will be one of moderate temperature in the South Atlantic and Gulf States and generally over the region west of the Mississippi River. High temperature will prevail the first part of the week in the Northern and Middle States east of the Mississippi River, followed by a change to lower temperature in these districts about Wednesday. A barometric depression that now covers the Rocky Mountain region will drift slowly eastward, preceded and attended by local showers and thunderstorms, and cross the Mississippi Valley Tuesday or Wednesday and the Middle Atlantic States Thursday or Friday. It will be followed by cooler weather over the Plains States, the Mississippi Valley, and the region east thereof.

Continued high temperatures, causing hundreds of deaths and much suffering, marked the weather for the week ending July 10 in northern and central districts east of the Mississippi River. A change to cooler weather set in over the upper Missouri Valley about the middle of the week and moved eastward, preceded by scattered local showers.

On July 9 the following forecast for the week ending the 16th was issued:

> In the Middle Atlantic and New England States the coming week will begin with warm and generally fair weather, followed by local thundershowers and a change to lower temperature Tuesday or Wednesday and moderate temperature and probably fair weather thereafter until the close of the week, when showers are again probable. In the Southern States the week will be one of seasonal temperatures, with frequent thundershowers. A change to lower temperature, attended by showers, will overspread the middle Mississippi and Ohio Valleys and the region of the Great Lakes Monday or Monday night and will be followed by generally fair weather and moderate temperature in these districts until the latter part of the week, when showers are again probable. Over the Plains States, the Rocky Mountain and Plateau regions, and the Pacific States the next several days will be generally fair, with moderate temperature, probably followed by a period of unsettled weather and local showers after Wednesday, except in the western portion of the Plateau region and in California, where the weather will be generally fair throughout the week.

The weather conditions were true to those forecast. Mean temperatures for the week ending the 17th were generally below normal east of the Mississippi River, except in the lower Lake region and New England. West of the Rockies the temperature was decidedly above normal, especially in Washington and Oregon, where maximum temperatures of nearly 110° were reported, and in northern California they exceeded that figure. Precipitation was generally deficient, except in the lower Lake region, the Ohio Valley, the Middle Atlantic States.

and the South, where rains were general and heavy. Advisory warnings of high westerly winds were issued for Lake Superior on the afternoon of the 10th and all stations on that lake reported strong westerly winds the following day.

On the 12th the Northern Hemisphere weather map showed a material reduction in the magnitude of the high-pressure area over the Atlantic Ocean and a corresponding increase in pressure over the North Pacific Ocean and Alaska. This being a general reversal in the pressure distribution over these areas, the following special bulletin was issued on that date:

For a prolonged period the barometric pressure has been above normal over the Atlantic Ocean and low over the northwestern portion of the American Continent. The International weather map of Wednesday showed a reversal in this pressure distribution—an extensive area of high barometric pressure appearing over Alaska, while the pressure over the middle latitudes of the Atlantic Ocean has fallen to below normal. This changed pressure distribution is strongly indicative of the dissipation of the warm weather over the Eastern States and the Middle West in the immediate future and the beginning of a period of moderate temperature in those districts lasting through the remainder of this and continuing into next week.

The cool weather announced in this bulletin overspread all parts of the country east of the Rocky Mountains on the 13th and 14th, and on the night of the 16th there were frosts in the cranberry marshes of Wisconsin, warnings of which were issued in the afternoon of that date. A change to warmer weather set in over the Pacific slope on the 14th and 15th and continued until the 18th and 19th, when a moderation began.

The following editorial is from the Courier-Post, Hannibal, Mo., of July 19:

That the theory of meteorologists as to the immediate cause of the long-continued heat in this country is correct is demonstrated by results. They claimed that an extensive area of high barometric pressure had prevailed over the Atlantic since June 13 and that its effect was to interfere with the usual eastward movement of waves of temperature, damming up the heat, as it were. About July 8 this "wall" disappeared and the effects were soon manifested. The heat wave moved eastward and cool currents followed. The heat conditions reached Europe on the 12th, giving Berlin a temperature of 102°, while the Yellowstone Park had 36°. What caused or dissipated the crest of high pressure is, however, a mystery yet unsolved.

The following is taken from the Globe-Democrat, St. Louis, Mo., of July 19:

It has been six days since the head of the Government Weather Bureau predicted the end of the long hot wave. His prediction has been so signally vindicated this time that it is worthy of special note, for great are the responsibilities and numerous the unavoidable embarrassments of the Weather Bureau, chiefly because human knowledge of the elements is still elementary compared to what we may expect it to be at the end of the next 100 years. On July 12 Chief Willis L. Moore said: "For a prolonged period the barometric pressure has been above normal over the Atlantic Ocean and low over the northwestern portion of the American Continent. The international weather map of Wednesday showed a reversal in this pressure distribution—an extensive area of high barometric pressure appearing over Alaska, while the pressure over the middle latitudes of the Atlantic Ocean has fallen below normal." This, said the weather chief, would bring a long-continued cool spell. The "spell" is here, and has been since Saturday last.

On the 16th the pressure continuing relatively low over the Atlantic Ocean and high over the North Pacific and Alaska, the following forecast for the week was issued:

The barometric pressure as shown by the International Weather Chart of the 16th instant is abnormally high over the interior of Canada and over Alaska and relatively low over the Atlantic Ocean. This pressure distribution is strongly indicative of temperatures below the seasonal average the coming week in practically all parts of the country from the Rocky Mountains to the Atlantic coast. West of the Rocky Mountains temperatures will average near or above the normal with generally fair weather, except that occasional showers are probable in the southern plateau and southern Rocky Mountain regions. The week will open with generally fair weather east of the Rocky Mountains, except that showers are probable Monday in the Middle Atlantic and New England States and during the next several days in the South Atlantic and Gulf States. An area of unsettled weather and showers will develop over the Middle West about Thursday and thence spread eastward to the Atlantic States by the latter part of the week.

For the week ending July 24, temperatures were generally below normal over the greater part of the country. Precipitation was quite general and abundant east of the Rocky Mountains except in the upper Mississippi Valley, the Dakotas, southern Texas, the Ohio Valley, the southern Appalachian Mountain region, southern and central Florida and Massachusetts. Showers occurred the first part of the week along the Atlantic coast and in the Gulf States, while during the latter part of the week showers were reported in the upper Missouri Valley and the upper lake region.

The following weekly forecast was issued July 23:

A barometric depression central Sunday over the plains States will advance eastward preceded and attended by general showers east of the Mississippi River and reach the Atlantic States Monday night or Tuesday. This disturbance will be quickly followed by rising pressure and a change to cooler weather which will overspread the Middle West Monday and the Eastern States Tuesday. Another barometric depression will appear in the Northwest Tuesday or Wednesday and advance eastward over the Middle West Wednesday or Thursday and reach the Eastern States about Friday. This disturbance will be preceded by a general change to warmer weather and in all probabilities it will be attended by showers in the North Pacific States and over much of the country from the Rocky Mountains to the Atlantic coast. No extremely high temperatures are probable during the week, except possibly in the extreme southwest and the interior of the South Pacific States, where an absence of precipitation is also probable.

The week ending July 31 was decidedly cool and was marked by a deficiency of precipitation east of the Rocky Mountains, while west of the Rockies conditions were about normal. The principal disturbance of the month formed over the northern Rocky Mountain region on the 21st, passed to the northern Plains States during the night of the 22d, and on the morning of the 23d was over the upper Mississippi Valley and showed signs of increasing intensity. It moved thence across the Great Lakes to the St. Lawrence Valley and passed over the Canadian maritime Provinces on the 25th. This disturbance gathered unusual intensity for a summer storm during its passage over the Great Lakes, the pressure at its center falling to 29.18 inches, and winds of gale force were recorded at practically all points on the Great Lakes and off the Atlantic coast from Delaware Breakwater to Eastport. The highest velocities reported were 72 miles at Buffalo and 60 miles at Toledo on the 24th. Storm warnings were displayed well in advance of the occurrence of these winds and undoubtedly prevented a considerable loss to shipping on the Great Lakes. A number of vessels that did not heed the warnings and seek shelter were lost or driven ashore. This disturbance was followed by an extensive area of high barometric pressure and unseasonably cool weather over all regions from the Plains States eastward from the 24th to 27th.

The following extract from a clipping regarding this storm is taken from the Daily Tribune, of Grand Haven, Mich., dated July 24:

A terrific gale lashed Lake Michigan into a fury last night. Old sailors stated freely this morning that the storm was the worst they had experienced at this time of the year. The storm started in yesterday with the wind varying in an easterly and southerly direction. The force of the blow was not felt on this shore until last night, when the wind went to the southwest and then to the northwest, settling down into a real tempest, which would have done credit to a November blow * * *. The highest velocity the wind registered at the United States Weather Bureau office in this city during the storm was 50 miles an hour at 3 o'clock this morning. For some time during the night the wind held to 48 miles steadily. The high wind is considered remarkable and out of the ordinary for this time of the year. In fact, it is recorded as one of the worst summer storms in the history of the bureau. However, the United States Weather Bureau furnished excellent service yesterday in warning sailors of the approach of the

storm. Special storm warnings were received here yesterday morning and by 10 o'clock the notice of the approach of dangerous gales was delivered to the steamboat companies.

During the night of the 27th a depression formed some distance off the middle Atlantic coast, and on the morning of the 28th the winds along the middle Atlantic and New England coasts were east to north, and rain had set in along the immediate coast. As there were evidences that this disturbance was of considerable intensity and moving north-northeast, northeast storm warnings were displayed at 9.30 a. m. on the New England coast from Stonington, Conn., to Portsmouth, N. H., and at 1.30 p. m. on the Maine coast. This storm moved northward as expected, and at 3.40 p. m. its center passed near Nantucket, where the lowest pressure was 29.38 inches. Gales were recorded the afternoon and night of the 28th in the region where storm warnings were displayed, the highest velocity being 64 miles an hour from the northeast at Nantucket, and heavy rains occurred over practically all of New England. This disturbance passed inland from the Maine coast and moved thence to the Canadian maritime Provinces with diminishing intensity on the 29th. Although the warnings were displayed well in advance of the high winds, several small vessels at sea were wrecked and 11 lives lost.

The following bulletin was issued on July 30:

The general barometric pressure shown by the International Weather Chart is such as to indicate that there will be no unseasonably high temperatures the coming week in any part of the country, except possibly in the extreme Southwest and the interior of the South Pacific States. Fairly well distributed precipitation is probable during the week in all districts from the Rocky Mountains eastward to the Atlantic coast. A barometric depression that is over the Northwest will advance slowly eastward and be attended by local showers the first part of the week in the region from the Mississippi Valley eastward. Another disturbance, which promises to be attended by general showers, will appear in the Northwest about Wednesday and move eastward, crossing the central valleys Thursday or Friday and the Atlantic States at the end of the week. This disturbance will be followed by considerably cooler weather in all Middle and Northern States from the Rocky Mountains to the Atlantic coast.

The month closed with temperatures below the normal west of the Mississippi River and in the South, while elsewhere they were above normal.

Average temperatures and departures from the normal.

Districts.	Number of stations.	Average temperatures for the current month.	Departures for the current month.	Accumulated departures since Jan. 1.	Average departures since Jan. 1.
New England	12	72.1	+3.3	+ 4.5	+0.6
Middle Atlantic	15	76.0	+1.6	+ 6.8	+1.0
South Atlantic	10	78.8	−0.2	+11.7	+1.7
Florida Peninsula *	7	80.5	−0.7	+11.1	+1.6
East Gulf	11	78.3	−2.0	+18.6	+2.7
West Gulf	10	80.8	−1.0	+21.7	+3.1
Ohio Valley and Tennessee	13	76.3	−0.5	+16.0	+2.3
Lower Lakes	10	72.8	+1.3	+12.5	+1.8
Upper Lakes	12	69.1	+1.3	+21.7	+3.1
North Dakota *	9	65.1	−2.9	+ 5.3	+0.8
Upper Mississippi Valley	14	75.2	+0.2	+23.0	+3.3
Missouri Valley	12	75.8	−0.1	+27.5	+3.9
Northern slope	9	65.7	−2.4	+ 7.0	+1.0
Middle slope	6	75.9	−0.8	+23.0	+3.3
Southern slope *	8	80.2	−0.1	+23.6	+3.4
Southern Plateau *	10	77.6	−2.6	− 0.6	−0.1
Middle Plateau *	10	70.4	−0.9	+ 4.6	+0.7
Northern Plateau *	11	69.2	+0.5	− 1.7	−0.2
North Pacific	7	62.4	+1.2	− 8.7	−1.2
Middle Pacific	5	66.6	−0.3	− 8.0	−1.1
South Pacific	4	70.7	+0.8	+ 0.4	+0.1

* Regular Weather Bureau and selected cooperative stations.

Average precipitation and departures from the normal.

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percentage of normal.	Current month.	Accumulated since Jan. 1.
New England	11	3.34	92	−0.3	− 5.0
Middle Atlantic	15	3.07	72	−1.2	− 7.4
South Atlantic	11	2.81	47	−3.2	−15.5
Florida Peninsula *	7	5.71	81	−1.3	−10.2
East Gulf	11	5.94	111	+0.6	− 5.0
West Gulf	10	4.01	125	+0.8	− 5.4
Ohio Valley and Tennessee	13	3.06	75	−1.0	− 4.2
Lower Lakes	10	2.87	85	−0.4	− 2.0
Upper Lakes	12	3.21	103	+0.1	− 0.7
North Dakota *	9	1.90	70	−0.8	− 1.0
Upper Mississippi Valley	15	3.34	92	−0.3	− 4.5
Missouri Valley	12	2.77	73	−1.0	− 6.7
Northern slope	9	1.25	76	−0.4	− 2.2
Middle slope	6	3.98	134	+1.0	− 3.7
Southern slope *	8	4.16	151	+1.4	− 2.8
Southern Plateau *	10	3.10	238	+1.8	+ 2.7
Middle Plateau *	11	1.18	203	+0.6	+ 0.8
Northern Plateau *	11	0.20	20	−0.8	− 2.3
North Pacific	7	0.19	28	−0.5	+ 7.3
Middle Pacific	7	T.	100	0.0	+ 3.5
South Pacific	4	0.03	100	0.0	+ 7.4

* Regular Weather Bureau and selected cooperative stations.

Average relative humidity and departure from the normal.

Districts.	Average.	Departure.	Districts.	Average.	Departure.
New England	75	−5	Missouri Valley	55	−11
Middle Atlantic	70	−4	Northern slope	56	+ 4
South Atlantic	76	−4	Middle slope	62	+ 2
Florida Peninsula	79	+1	Southern slope	64	+ 5
East Gulf	79	+1	Southern Plateau	54	+16
West Gulf	74	0	Middle Plateau	46	+14
Ohio Valley and Tennessee	66	−3	Northern Plateau	36	− 5
Lower Lakes	64	−5	North Pacific	72	+ 7
Upper Lakes	67	−5	Middle Pacific	60	− 6
North Dakota	60	−6	South Pacific	66	+ 2
Upper Mississippi Valley	60	−8			

Average cloudiness and departure from the normal.

New England	5.1	0.0	Missouri Valley	4.2	0.0
Middle Atlantic	4.7	−0.2	Northern slope	3.9	+0.2
South Atlantic	5.5	+0.3	Middle slope	5.1	+1.0
Florida Peninsula	5.7	+0.3	Southern slope	5.1	+0.6
East Gulf	6.8	+1.4	Southern Plateau	4.3	+1.0
West Gulf	5.6	+1.5	Middle Plateau	4.1	+1.0
Ohio Valley and Tennessee	5.1	+0.5	Northern Plateau	2.4	−0.3
Lower Lakes	3.8	+0.7	North Pacific	4.5	−0.1
Upper Lakes	4.5	−0.1	Middle Pacific	4.1	+0.6
North Dakota	3.8	−0.6	South Pacific	3.6	+0.8
Upper Mississippi Valley	4.4	+0.1			

Maximum wind velocities.

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Abilene, Tex.	31	60	se.	Mount Tamalpais, Cal.	2	50	nw.
Buffalo, N. Y.	24	72	w.	Do	17	56	nw.
Do	25	68	w.	Mount Weather, Va.	25	54	w.
Cleveland, Ohio	24	52	w.	Nantucket, Mass.	28	65	ne.
Columbus, Ohio	24	63	w.	New York, N. Y.	21	62	nw.
Detroit, Mich.	24	51	w.	Do	24	57	sw.
El Paso, Tex.	21	50	w.	Pierre, S. Dak.	8	50	w.
Grand Haven, Mich.	24	51	w.	Point Reyes Light, Cal.	7	54	nw.
Green Bay, Wis.	15	56	nw.	St. Paul, Minn.	4	54	n.
Huron, S. Dak.	30	52	ne.	Toledo, Ohio	24	60	sw.
Marquette, Mich.	24	54	nw.				